

Flexible Film Analysis



Introduction:

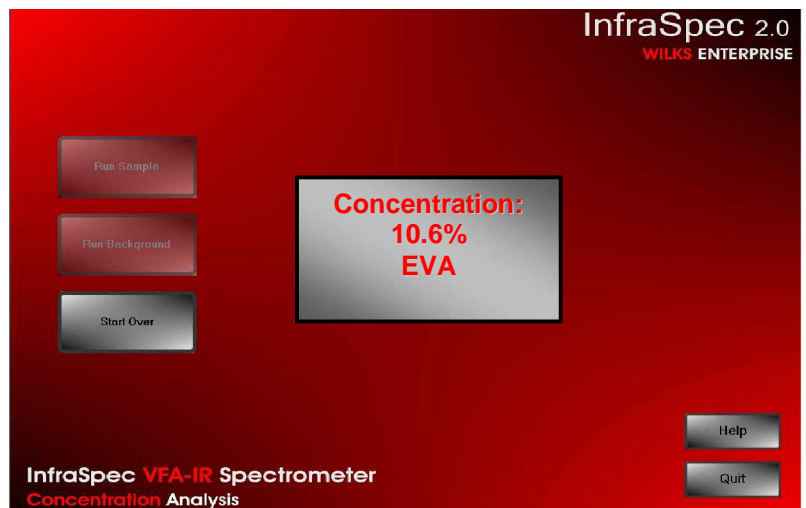
There are many areas in flexible film production that can benefit from a rapid onsite measurement that the InfraSpec VFA-IR Spectrometer offers. Examples include determining which side is which on multilayer films to be laminated, checking rolls of film in the warehouse, measuring an individual layer within a film in the production area, raw material verification, and formulation discrimination. Polymers such as nylon, EVOH, EVA, and polyethylene have characteristic absorbances in the mid infrared range that can be used for material identification or for quantitative measurements. The InfraSpec VFA-IR Spectrometer offers a light weight, rugged and portable solution to on-site applications at a much lower cost than and FR-IR. The InfraSpec VFA-IR Spectrometer brings the measurement out of the laboratory to where it is needed, in the production area, on a loading dock or in a warehouse.

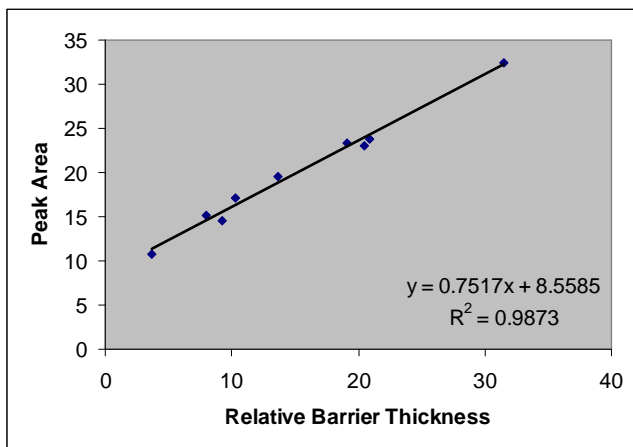
Operating Principal:

The InfraSpec VFA-IR Spectrometer is a new concept in infrared instrumentation. It utilizes a patented design consisting of an Attenuated Total Reflection (ATR) sample plate with an electronically modulated source on one end and a linear variable filter (LVF) and combined with a 128 pixel detector array on the other. The result is an infrared analyzer that, unlike an FTIR spectrometer, has no moving parts and an insignificant optical air path. This makes for a portable, rugged analyzer suitable for use in a field environment. A LVF typically covers an octave in wavelength (ie: 2.5-5.0 μm ($2000\text{-}400\text{ cm}^{-1}$), 5.4-10.8 μm ($1850\text{-}925\text{ cm}^{-1}$) or 7-14 μm ($1430\text{-}710\text{ cm}^{-1}$)). Either an ATR (attenuated total reflection) or transmission sample system can be used depending on the application.

Analysis:

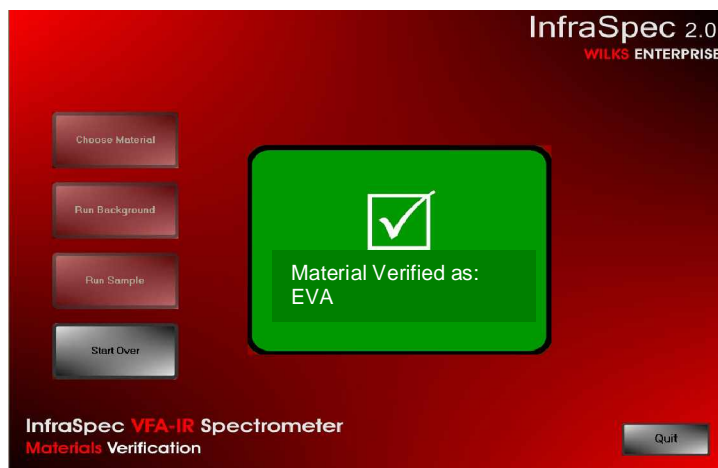
Infrared has proven to be a reliable measurement technology for flexible film production. Each step in manufacturing a quality product requires analysis. For multilayer films, ethyl vinyl acetate (EVA) concentrations can affect the physical properties of the sealant or tie layer. There are also limits for EVA as food contact layer of the film. Knowing the % EVA can be critical. A simplified interface allows non technically trained personnel to obtain measurements onsite.





Nylon is typically used as a barrier layer in films. The thickness of this layer is critical for both performance and cost. Traditionally, a variety of techniques have been utilized to measure the nylon layer gauge including optical microscopy, gravimetric solvent extraction and FTIR analysis. Each of these systems lack the robustness and ease of operation for use on the production floor. This plot shows the barrier layer thickness in relation to the infrared absorbance of the peak area using the InfraSpec VFA-IR Spectrometer. A numeric value for the barrier layer thickness can be internally calculated by the InfraSpec VFA-IR Spectrometer software as shown in the previous example.

When two different films to be laminated are not symmetrical, it is critical that both have the correct orientation before the adhesive and laminate is applied. If the top and bottom consist of two different layers such as ethylene vinyl acetate (EVA) and polyethylene, the sides can be distinguished by infrared analysis using the InfraSpec VFA-IR Spectrometer. For the operator in the production area, a piece of film is pressed onto the ATR sample plate and 15 seconds later he knows which side is which for proper film lamination.



Specifications:

Dimensions	5" x 5" x 1.5", 12.7 x 12.7 x 3.8 cm
Weight	3.5 lbs., 1.5 kg
P.C. Interface	RS 232, USB
Power Requirements	12V DC, 2.0 amps
Power Supply	Universal AC/DC converter type (supplied as standard)
Suggested Temperature Operating Range	15°C - 60°C
Humidity	0 – 98% relative humidity (non-condensing)
Detector Array	128 Pixel linear pyroelectric array
Array Responsivity	5.4·10⁵ V/W
Standard Spectral Ranges	2.5-5 μm (4000-2000 cm⁻¹), 5.5-11 μm (1818-910cm⁻¹), 7-14 μm (1430-710 cm⁻¹)
Resolution	25 cm⁻¹
For InfraSpec VFA-IR Spectrometer ATR Sample Plate	
ATR Crystal Material	Cubic Zirconia, Zinc Selenide, or Zinc Sulfide
ATR Surface Size	50 x 16 mm
# of Reflections	10
For InfraSpec VFA-IR Spectrometer Transmission Model	
Transmission Card Holder	Cards supplied by customer

Wilks Enterprise, Inc.

140 Water Street · South Norwalk, CT 06854 USA

Tel: 203-855-9136 · Fax: 203-838-9868

E-Mail: info@wilksir.com · www.wilksir.com

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